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# SOUTHWEST FISHERIES CENTER

MONTHLY REPORT - JULY 1979

TABLE OF CONTENTS AND RESEARCH HIGHLIGHTS


| | Page |
|---|---|
| PUBLICATIONS | 1 |
| HONOLULU LABORATORY | 4 |
| Hormone-Induced Tuna Spawning Continues to be Successful | 7 |
| LA JOLLA LABORATORY | 9 |
| State and Federal Agencies Agree to Continue Cooperative Scientific Investigations in California Current | 14 |
| Final 1978 Atlantic Tuna Statistics Sent to ICCAT | 17 |
| PACIFIC ENVIRONMENTAL GROUP | 24 |
| TIBURON LABORATORY | 25 |
| Many Juvenile Rockfish Found on Mendocino Coast this Year | 25 |
| Commercial Trawl Made for Shortbelly Rockfish | 27 |
| Physiology Investigations on Striped Bass Continue | 29 |
| SOUTHWEST REGIONAL DATA MANAGEMENT AND ADP OPERATIONS | 31 |
| Orion Interface Problems Solved | 31 |
| MISCELLANEOUS | 40 |
| Press Releases, Honors and Awards, Seminars, Training, Meetings and Travel, Visitors and Personnel | 40 |


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# SOUTHWEST FISHERIES CENTER
# LA JOLLA, CALIFORNIA

## HONOLULU LABORATORY
## LA JOLLA LABORATORY
## TIBURON LABORATORY
## PACIFIC ENVIRONMENTAL GROUP

## MONTHLY REPORT - JULY 1979

STATUS OF PUBLICATIONS

Published

Dizon, Andrew E. and Richard W. Brill. 1979. Thermoregulation in tunas. Am. Zool. 19:249-265.

Because tunas possess countercurrent vascular pathways serving the trunk musculature, metabolic heat is retained, and muscle temperatures can considerably exceed that of the surrounding water (+1° to +21° C). And because tunas have this excess, it is reasonable to suppose they have some means of controlling its magnitude. Tunas must contend with two exigencies which can perturb body temperature: changes in water temperature and, in contrast to non-thermoconserving fish, changes in activity. Both can be met by adaptive change in excess muscle temperature. If this could be accomplished in the absence of changes in environmental temperature or activity level, this would constitute physiological thermoregulation. If excess muscle temperature cannot be altered sufficiently to acceptable levels, more favorable environmental temperatures must be sought or activity levels changed. We would consider this behavioral thermoregulation. High sustained swim speeds, characteristic of the continuously swimming tunas, require special consideration. Heat production is proportional to approximately the cube of swim speed. In order to maintain a slight temperature excess at basal swim speeds (1-2 lengths/sec), and yet not overheat during sustained high speed swimming (>4 lengths/sec), mechanisms are required to conserve heat under the former conditions and to dissipate it effectively under the latter. In this report, we review published observations other investigators have interpreted as physiological thermoregulation in tunas, describe recent findings in our laboratory, and suggest some possible thermoregulatory mechanisms.

*THIS REPORT DOES NOT CONSTITUTE PUBLICATION AND IS FOR INFORMATION ONLY*

Hobson, E.S. Interactions between piscivorous fishes and their prey. In Proc. Predator-Prey Symposium in Fisheries Management. Sport Fishing Institute, Washington, D.C.

Most fishes that prey on other fishes face what might seem a simple enough task: they must run down, or otherwise capture, organisms that are smaller, weaker, and slower than they are. But the job is not so simple and straightforward after all. In fact, the diverse feeding equipment and behavior that occur among piscivorous fishes indicate they face severe problems capturing prey. Attacks by fish-eating predators during the evolution of modern species have pressured prey to acquire effective defensive adaptations. But every successful defense has in turn evolved an appropriate offense, so that a delicate balance now exists. The opposing forces that maintain this balance as expressed in the adaptations of both predator and prey, and the patterns of predation that have resulted, are the topics of this paper.

Perrin, W.F., P.A. Sloan and J.R. Henderson. 1979. Taxonomic status of the southwestern stocks of spinner dolphin, Stenella longirostris, and spotted dolphin, S. attenuata. 29th Report of the International Whaling Commission, pp. 175-184.

Approved by Center Director

Coe, James and Warren E. Stuntz. Passive behavior by spotted dolphins, Stenella attenuata, in tuna purse seine nets. For publication in the U.S. Fishery Bulletin.

Laurs, R. Michael, David C. Morrison, Frank Conte, Richard J. Ulevitch, and John Olson. Blood volume determination in the higher teleost albacore tuna (Thunnus alalunga). For publication in Science.

Mendelssohn, Roy. Using Box-Jenkins model to forecast fishery dynamics I: Identification, estimation, and checking. For publication in U.S. Fishery Bulletin.

_____. Using Markov decision models and related techniques for purposes other than simple optimization I: Analyzing the consequences of policy alternatives on the management of salmon runs. For publication in U.S Fishery Bulletin.

Smith, Tim D. On the use of line transect techniques for estimating the density of porpoise schools in the eastern tropical Pacific. For publication in the Journal of Wildlife Management.

Weihs, Daniel. Hydrodynamics of suction feeding of fish in motion. For publication in the Journal of Fish Biology.

## Administrative Reports

### Honolulu Laboratory

Mendelssohn, Roy and Edward J. Sondik. 1979. The cost of information seeking in the optimal management of random renewable resources. SWFC Admin. Rep. H-79-12, 15 p.

Sondik, Edward J. and Roy Mendelssohn. 1979. Information seeking in Markov decision processes. SWFC Admin. Rep. H-79-13, 15 p.

### La Jolla Laboratory

Huppert, D. 1979. Report to the Pacific Fisheries Management Council on the anchovy fishery for 1978/79. SWFC Adm. Rep. LJ-79-23.

MacCall, A. 1979. Recent anaerobic varient sediments of the Santa Barbara and Guaymas Basins with special reference to occurrence of fish scales. SWFC Adm. Rep. No. LJ-79-24.

Haight, C., Moser, G. and Smith. 1979. Data entry programs: CalCOFI II. Fish eggs and larvae identification sheet. SWFC Adm. Rep. No. LJ-79-25.

Collins, R., Huppert, D., MacCall, A., Stauffer, G., and Radovich, J. Joint Calif. Dept. of Fish and Game/National Marine Fisheries Service management information document for Pacific bonito. SWFC Adm. Rep. No. LJ-79-26.

## Translation

Sogo. 1979. Bluefin tuna spawn in captivity--World's first record of artificial fertilization and hatching of bluefin tuna. [In Jpn.] Sogo, June 27, 1979. (Engl. transl. by Tamio Otsu, 1979, 2 p., Transl. No. 37.)

# HONOLULU LABORATORY

## Tuna Billfish Stock Assessment Workshop Finds No Overfishing

Of the tuna and billfish stocks in the Pacific and Indian Oceans reviewed at a recent meeting, none appears to be overfished, according to Richard Shomura, Director of the Southwest Fisheries Center's Honolulu Laboratory, and Co-chairman of the recent Stock Assessment Workshop. Dr. S. Ueyanagi of the Fisheries Agency of Japan's Far Seas Fisheries Research Laboratory shared the chairmanship of the meeting, which was held in Shimizu, Japan from June 13 through 30. The workshop was jointly sponsored by the Co-chairmen's agencies.

North Pacific albacore, skipjack tuna, and Pacific billfishes were not included in the stocks examined by workshop participants. Data from all other stocks were reviewed, and although no stock was identified as being overfished, a few--including the southern bluefin tuna--are thought to be fished to the point where increased fishing efforts will not bring about large increases in yield.

Joining Shomura as participants from the Southwest Fisheries Center were Dr. Jerry Wetherall of the Honolulu Laboratory and Drs. Gary Sakagawa and Norman Bartoo of La Jolla.

## RESOURCE ASSESSMENT AND DEVELOPMENT INVESTIGATIONS (RADI)

### Fishery Management Algorithms to be Made Easily Accessible

Dr. Roy Mendelssohn, Operations Research Analyst, and Laurie Tsuji, Computer Technician, have been developing a user-oriented computer package to implement many of the algorithms that have been developed to estimate transition probabilities and calculate optimal policies for randomly varying populations. The package will provide an integrated set of computer programs that are accessible to the ordinary person in fisheries management without his having to sift through the difficult mathematical literature where many of these algorithms have been published. The package will include several new algorithms that have been developed by Mendelssohn and Dr. Edward J. Sondik of the National Institutes of Health.

### Regulations for Precious Coral Analyzed

Dr. Michael Adams, Industry Economist, is drafting a report that analyzes regulatory measures for precious corals in the western Pacific. The proposed regulations, which will be incorporated in the Fishery Management Plan for precious corals, are expected to have little effect on the industry since the recommendations are similar to existing Hawaiian law. The new measures and

their possible alternatives will be evaluated in light of significant internal changes in the western Pacific's major coral-jewelry-producing firm.

## Hawaiian Tuna Data Base Being Created

Linda Hudgins, Economist, Gary Kamer, Statistician, and James Cooper, Research Assistant, are creating a data base on the Statistical Analysis System (SAS), compiling information about the tuna industry in Hawaii. The SAS is being used because it has good data handling capabilities and can be used easily with a variety of statistical packages. Creation of the data base is part of the integrated study of the tuna industry in Hawaii. The study will be the subject of Hudgins' Ph.D. dissertation.

## Plans for South Pacific Cruise Completed

Richard N. Uchida, Leader, Insular Resources Task, and Walter M. Matsumoto, Fishery Biologist, prepared final cruise instructions for Townsend Cromwell cruise 79-04, which is scheduled to begin on August 18. Matsumoto will be Chief Scientist on this cooperative cruise, which will involve the Honolulu Laboratory and the Governments of American and Western Samoa. Matsumoto plans to deploy fish aggregation buoys and to survey and assess the demersal and pelagic fishery resources over seamounts, banks, reefs, and offshore fishing grounds around American and Western Samoa. In addition to Matsumto, members of the scientific field party will include Research Assistants Bert S. Kikkawa, Paul M. Shiota, and Darryl T. Tagami.

## Northwestern Hawaiian Islands Spiny Lobster Studies Continue

Dr. Jeffrey Polovina revised the manuscript, "Analysis of catch and effort data for the spiny lobster, Panulirus marginatus, at Necker Island," coauthored with D. Tagami, following its in-house review.

Relative to his work on spiny lobsters, Polovina is doing additional analyses of the data and has prepared the first draft of a manuscript describing a general statistical information system to assist fishery managers in decision-making. The system, which consists of a sampling scheme, computerized data base, and statistical package, produces periodic updates of the resource data. Polovina is currently applying the theoretical system to the spiny lobster fishery.

## Ova Development and Growth of Pink Snapper Studied

Research Assistants Linda C. Hubbell and Bert S. Kikkawa examined ovaries of pink snapper, Pristipomoides filamentosus, from NWHI waters, and found ova development to be heterogeneous. The advanced ova appear to be concentrated in the inner, midsection of the ovaries. Furthermore, comparison of ova

diameters from the large and small lobes suggests that egg development is more advanced in the larger lobe. The mean diameter of maturing ova in the pink snapper was 0.51 mm and that of ripe ova was 0.55 mm.

In another area of pink snapper biology, Fishery Biologist James H. Uchiyama began to analyze otolith daily growth ring data. Research Assistants Jose Enitan and Jeffrey Sampaga counted the minute growth rings, providing the data for Uchiyama's analysis. Preliminary results indicate that female pink snapper grow faster than the males, but Uchiyama says that ring counts from larger fish are needed to complete the upper parts of the growth curves.

## Oxygen Uptake Data on Kawakawa Reexamined

Fishery Biologist Reginald Gooding reexamined kawakawa respiration data that were collected several years ago. Kawakawa, Euthynnus affinis, (mean wt. 2,000 g) swimming at a mean speed of 1.4 lengths per second, had a mean oxygen uptake of 0.420 mg of oxygen per gram per hour. The relation of oxygen uptake to speed is described by the equation: log oxygen uptake (mg $O_2$ $g^{-1}$ $h^{-1}$) = -0.558 + 0.126 speed (lengths $sec^{-1}$). The regression equation for skipjack tuna of the same mean size and swim speed was: log oxygen uptake = 0.438 + 0.109 speed (Gooding and Neill, manuscript in prep.). The mean oxygen uptake rate was 0.521 mg $O_2$ $g^{-1}$ $h^{-1}$.

As might be expected, kawakawa respiration was lower than that of skipjack tuna. No work on kawakawa respiration has been published, so these data, although limited, may be noteworthy.

## Ciguatera Work Continues

Research Assistant Bernard Ito reported that he continues to sample fish for ciguatoxin, a difficult-to-predict poison found in tropical fish. Ito sampled kahala, Seriola dumerilii, landed at the United Fishing Agency's auction market. Of the 153 fish tested, 12 were suspected of being contaminated with the toxin.

Meetings and discussions were held among University of Hawaii researchers and Honolulu staff members Uchida, Polovina, Tagami, and Computer Technician Lucille Tsukano, to work out the details of a scheme to record ciguaters data on a newly-designed log sheet and subsequently analyze it.

## Change in Federal Energy Policy Leads to SWFC Research Flight Cancellation

After trying for ten weeks to work out a schedule for a Northwestern Hawaiian islands biological aerial survey flight compatible with U.S. Coast Guard flights, Fishery Biologist R. Gooding finally scheduled one for July 17; however, as a direct result of the national energy conservtion policies announced the day before the flight, Barbers Point Naval Air Station was directed to discontinue all non-emergency low level flying. Gooding and Ito

will therefore complete the final feasibility report on censusing marine mammals from U.S. Coast Guard aircraft without the desired additional flight.

## Work Continues on Study of Seabird Food Habits

Thomas S. Hida, Fishery Biologist, continued work identifying material in the spew of seabirds. Of interest was the occurrence of large (84-109 mm) isopods in several samples from Laysan albatross, Diomedea immutabilis, stomachs. The isopods will be sent to specialists at the U.S. National Museum for identification.

## Hawaii Skipjack Tuna Landings Continue Below Long-Term Average

The July 1979 Hawaii landings of skipjack tuna were estimated at 589.9 metric tons (MT), which is 168.8 MT above the July 1978 landings but 229.7 MT below the 1948-78 long-term average for July. The cumulative landings from January through July were estimated at 1,770.0 MT, which is 443.9 MT below the 1978 landings for the same period and 874.5 MT below the 1948-78 long-term average for the same period.

## Hormone-Induced Tuna Spawning Continues to be Successful

Attempts to induce kawakawa to spawn in shoreside tanks at the Honolulu Laboratory continue to be successful, according to Dr. Calvin M. Kaya, a visiting scientist from Montana State University. About 300 tuna larva hatched out in glass containers about 31 hours after hormone-induced spawning yielded milt and eggs from the fish.

The female, which had been in captivity for four weeks, was subjected to biopsies during that period, allowing researchers to watch the mean diameter of the largest ova increase from 0.44 mm to 0.56 mm. The male, captured five months before the induced spawning, yielded viscous milt on biopsy.

Treatments that had proven successful in last month's trial were modified and administered in two series of injections 24 h apart:

| | Day 1 | Day 2 |
|---|---|---|
| Female | 10 mg SP, 500 IU HCG | 10 mg SP, 1,000 IU HCG, 2,000 IU PMS |
| Male | 1,000 IU HCG | 1,000 IU HCG, 1,000 IU PMS |

Biopsy of the female 24 h after the first injections showed that mean diameters of the largest ova in this specimen had increased to 0.70 mm. By this time, milt of the male had thinned and could be taken. The second injections were given at 6:00 p.m. and the female released ova sometime between 12:00 midnight and 5:30 a.m. the next morning.

The tuna were stripped at 7:15 a.m. to effect fertilization, and most of these fertilized ova remained floating when placed in glass containers 10 min later. The first cleavage divisions were observed about an hour later, and first hatching of larvae were observed about 31 h after fertilization (water temperature 21.1°-26.3° C). With the limited facilities for maintaining the developing embryos, it was possible to sustain only a small fraction of the fertilized ova. The 300 hatched larva continued developing and absorbing their yolk sacs over the next 2 days. No attempt was made to feed them so all were dead by the third day following hatching. Although Kaya has not made quantitative estimates, he believes that the number of ova stripped from the female exceeded 50,000. More than 200,000 ova may have collected in the strainers, which sample about half of the outflow water from the spawning tank.

With this second successful induced spawning in as many attempts, it appears that the technique can be developed into a routine procedure.

# LA JOLLA LABORATORY

## Coastal Fisheries Resources Division

### ALBACORE FISHERIES PROGRAM

#### Preparations Made for Albacore Environmental/Physiology Cruise

Dr. R. Michael Laurs, Leader of the Albacore Fisheries Program, and members of his staff made preparations for a 14-day cruise in early August whose objective will be an intensive investigation of the physiology and biochemistry of albacore. Among the work to be conducted are studies of blood volume; blood cell identification and counts; blood gas tension and pH; measurement, on live albacore, of cardiac output and cardiovasclar blood pressures, functional studies of immune systems and selected enzymes, and studies of vascular anatomy and of stasis metabolism. Conventional methods for obtaining these measurements have been modified for use at sea with live fish.

Physiologists will join this cruise from the University of California at San Diego School of Medicine, Oregon State University, Scripps Institution of Oceanography, and the Scripps Clinic and Research Foundation.

A second important objective of the cruise will involve work in cooperation with the fishing vessel, Linda, which is on charter to the American Fishermens' Research Foundation. Dr. Andrew Dizon, Fishery Biologist with the Southwest Fisheries Center's Honolulu Laboratory, Lieutenant (jg) H. Jemison of the NOAA Corps, and Biological Technicians R. Dotson and S. Revey of the La Jolla Laboratory will be conducting sonic tracking of albacore aboard the Linda. Battery-powered, signal emitting tags will be attached to the captured albacore and the fish will then be released to be followed by hydrophone. The sonic tags will encode either pressure (depth) or water temperature in their rate of signal emission. While the scientists aboard Linda are following the fish, the group aboard the Jordan will take oceanographic samples in a grid-like pattern around the fishing vessel in order to relate the movements of the sonic-tagged albacore to features of the ocean environment.

### LARVAL FISHES, CALCOFI PROGRAM

#### Comparative Results Available on Spawning Frequency of Northern Anchovy

Dr. J. Hunter reports that Bev Macewicz, Biological Technician, has completed all the analytical work for the anchovy gonad surveys taken January through April 1979. The results of this year's work, based on the incidence of day-old post-ovulatory follicles, are compared to findings from 1977 and 1978:

| Survey period From | To | Year | % females spawning | No. of females | Locality |
|---|---|---|---|---|---|
| 3-20 | 3-21 | 1977 | 14.2 | 148 | Los Angeles Bight |
| 2-15 | 2-26 | 1978 | 15.9 | 295 | " " " |
| 1-26 | 2-13 | 1979 | 13.5 | 394 | " " " |
| 3-22 | 3-25 | 1979 | 9.2 | 131 | " " " |
| 4-1 | 4-14 | 1979 | 10.3 | 461 | " " " |
| 3-20 | 3-22 | 1979 | 0.0* | 150 | Monterey Bay |

* No day-old post-ovulatory follicles present, on basis of new post ovulatory follicles, incidence of spawning = 1%.

The frequency of spawning females in the Los Angeles Bight was slightly lower in 1978 than in 1979 but the estimates are quite similar. There appears to be a slight decline over the peak months of spawning indicating that the interval between spawnings may increase from 1 week to about 10 days over the peak 3 months of breeding. The low spawning frequency of anchovy taken in March 1979 in Monterey Bay is of interest. Most ovaries were resorbing ova-eggs in all stages of development, including large ones, were undergoing atresia. For northern anchovy occurring in the Monterey Bay area, spawning was over by March, whereas spawning continued at a high level in the Los Angeles Bight.

## Fourth Draft of Jack Mackerel Plan Distributed to Fishery Council

A fourth draft of the Jack Mackerel Fishery Management Plan was printed and distributed for the Pacific Fishery Management Council. No Council action was taken at the July meeting. Consideration of the Plan was slated for the August meeting in San Jose, when the Council is expected to approve the Plan for purposes of public review. J. McMillan completed the regulatory analysis of the Plan, and her work is available for inspection.

## Studies Started to Compare Morphology of Lab-Reared Mackerel Larva with Sea-collected Samples

In a recent study of laboratory-reared jack mackerel larvae, Fishery Biologist Gail Theilacker correlated external larvae shape to the nutritional condition of the individual larvae. These morphometric criteria may prove useful for estimating larval survival in the field if it can be shown that the relationship between sizes of larval body parts is the same in the laboratory and in the field. Evidence of morphometric differences between laboratory-reared and sea-collected larvae, however, suggests that it may be difficult to apply laboratory data to sea-reared larva.

Two studies are being made to determine whether the morphometric criteria, resolved using laboratory-reared larvae, can be used to estimate condition of wild larvae: 1) morphometric estimates of condition of wild larvae are being compared to their histological estimates (histological criteria usually assess the actual feeding condition of the larvae), and 2) the effects of handling and preservation on shrinkage of larval fish body parts are being determined.

Theilacker has demonstrated that for larvae of the same live length, net-collected larvae shrink more than laboratory-handled larvae pipetted directly into preservative. The morphometric differences that have been reported between laboratory-reared and sea-collected larvae of the same preserved length may therefore be caused by handling prior to preservation.

For the histological study, researchers took short-duration plankton tows and preserved larvae in Bouin's fixative (preservative preferred for histology) during the July David Starr Jordan cruise; more samples will be taken next month. After sorting jack mackerel larvae from the plankton, researchers will measure them to estimate their condition using morphometric criteria, and examine the larvae using histological criteria.

Theilacker also started a study to determine how handling and preservation affect larval fish shrinkage. Jack mackerel eggs were collected at sea, and the larvae are being reared in the SWF aquarium. Body parts are measured on live larvae, and then the larvae are either treated in a net and preserved in Bouin's or formalin fixative (to simulate field collection and preservation), or pipetted directly into fixative (laboratory handled).

## Bering Sea Study Of Larval Pollock Feeding Completed

Dr. Lasker reports that Elizabeth Clarke, Scripps graduate student working at the Center, has returned from a 3-month ichthyoplankton cruise to the Bering Sea aboard the R/V Thompson. Her project was to study larval pollock (Theragra chalcogramma) feeding on shipboard and to attempt to correlate the various foods in the water with successful feeding. She returned with many samples of pollock larvae for analysis. Living pollock larvae were obtained from the NWAFC/Auke Bay Laboratory allowing Clarke to conduct experiments at sea during the first few weeks of the cruise when wild larvae were not to be had.

Clarke's work is part of a project on the Bering Sea at the University of Alaska supported by the National Science Foundation. Dr. Lasker is a participant in the program.

As part of the same project, a contract has been let to Dr. Roland Garwood of the U.S. Navy Postgraduate School to relate atmospheric forcing to the establishment and breakup of larval food patches in the upper layer of the ocean. Garwood will study Bering Sea field data of near-surface temperature structure in conjunction with meteorological data to determine the most significant space and time scales of patchiness. He will compute the

parameters needed to test and calibrate his theoretical model of patchiness growth and decay based on a turbulent kinetic energy budget. Garwood believes that the approach will also be applicable to other important fisheries areas such as the Southern California Bight.

## Birthdate Distribution of 1978 Anchovies Being Assessed

Richard Methot, Fishery Biologist, reports that determination of the birthdate distribution of the 1978 anchovy year class is nearly accomplished. In six samples collected between San Diego and Santa Monica Bay from September 1978 to February 1979, 58 of 82 fish analyzed were born in March or April of 1978. Most of these fish were 70-85 mm at the time of capture. These samples are representative of the bulk of the year class. One sample collected at Long Beach in February 1979 contained smaller fish (60-75 mm) born between May and August 1978. North of Santa Monica Bay, fish of the 1978 year class were much less abundant and larger (80-110 mm). Most of these fish were born between December 1977 and February 1978. These results appear to bear out the premise that conditions were generally unfavorable for larval survival from November through February 1978 in the Los Angeles Bight region. December through February was an unusually stormy period in 1978.

## Anchovy Eggs "Aged" and "Staged"

Dr. E. Ahlstrom, Senior Scientist, has instructed Biological Technicians Lucy Dunn and Frances Pocinich of Scripps Institution of Oceanography in the technique of determining the age and developmental stage of anchovy eggs. Eggs spawned on four successive days were usually represented in the collections, and inasmuch as spawning is limited to a few hours each night (usually between 8 p.m. and midnight), there was a clear separation in the stage of development between eggs of the several days found in the collections.

Eggs were readily "staged" in samples where they were preserved in good condition, but because of yolk ruptures, determining developmental stages proved more difficult and tedious when eggs were poorly preserved. With experience and persistence, however, even poorly preserved eggs were reliably "staged."

For most samples, the workers encountered no difficulty in determining the age of the eggs, which were divided into four age groups: those spawned within 24 hours of the time of collection; those 24 to 48 hours old; those 48 to 72 hours old; and eggs 72 to 96 hours old.

The eggs from one of the samples could not be so simply "aged." They had apparently been developing at different temperatures, so their growth rates varied. All 11 recognized stages of development were represented in eight collections, although not all 11 were found in any one collection. Some hours were spent separating the eggs from this sample into the four days represented. Fortunately, this type of situation is the exception.

COMMERCIAL AND RECREATIONAL FISHERIES RESEARCH FOR MANAGEMENT

## Low Catch Rates Seen in Anchovy Reduction Fishery in 1979

The U.S. anchovy reduction fishery experienced very low catch rates and a high incidence of small fish during the fall of 1978 and winter of 1979, according to D. Huppert and G. Stauffer, who presented a report to the Pacific Fishery Management Council (PFMC) in Los Angeles, July 12. The Southwest Fisheries Center scientists noted that fishing improved in the late spring, with about 4,000 tons being landed weekly until the season was closed in the southern area on June 8, when the quota of 52,578 tons had been taken. The non-reduction fisheries took only 6,841 tons of the 12,600 tons reserved for non-reduction use. Live-bait fishing encountered sporadic availability and "pinheads" in the winter and late spring. The reduction fishery in Ensenada was reported to have taken 143,000 short tons in 1978 and 47,000 tons through June 1 of 1979. This last figure is three times the catch for the corresponding period of 1978.

Age composition of the reduction fishery harvests from both sides of the border indicate that 60-70% of the 1979 anchovy biomass is from the 1978 year class. The class appears to be of moderate size (1.0 to 1.2 million tons) and seems to have come primarily from the late spring spawning of 1978. The preponderance of late-spawning fish is responsible for the delayed appearance of legal-sized fish in southern California, which did not appear until late spring this year.

Because neither the northern area reduction fishery nor the non-reduction fishery took the amounts reserved for them in the 1978/79 fishing year, the PFMC asked that the Anchovy Team develop an in-season reallocation scheme to assure full utilization of the optimum yield. Management options to accomplish this are being developed for presentation to the Council in September.

## Vessel Construction Survey Making Headway

Economist Jane McMillan has been continuing her research into the construction of fishing vessels in the United States. She is examining how the Fisheries Conservation and Management Act of 1976 has affected fishing vessel construction, and she has been measuring associated economic impacts. McMillan met with two National Marine Fisheries Service economists, Rich Marasco and Mort Miller, on July 19 and 20 in Seattle to develop a work plan for the study.

The study's objectives are to: (1) determine trends in commercial fishing vessel construction by area built, from 1960 the present, (2) determine the area or fishery in which vessels under construction in 1979 will

operate, (3) estimate expenditures on commercial fishing vessel construction by region where vessels are built, (4) analyze trends to determine the influence of the Management Act, and (5) estimate economic impacts stemming from vessel construction, in the regions where vessels are built.

McMillan is investigating appropriate investment models and will analyze the data collected in this study using regression analysis. Preliminary results are expected by October, with a final paper to be submitted by December.

## San Diego Fish Market Surveyed for Study

Work is progressing on the economic study of the San Diego market fish fisheres. Dennis Fitzpatrick, a Sea Grant intern under the supervision of Jane McMillan, has been conducting interviews with industry representatives. Having already made contact with processors, wholesalers, retailers, brokers and fishing associations, he expects to obtain further information from fishers and restaurateurs. McMillan and Fitzpatrick are working on a model of the fishermen/dealer relationship to analyze the findings of this study.

## State and Federal Agencies Agree to Continue Cooperative Scientific Investigations in California Current

A new era in the 40-year history of the California Cooperative Oceanic Fisheries Investigations (CalCOFI) began on July 1 when Izadore Barrett, Director of the Southwest Fisheries Center, representing the National Marine Fisheries Service, Dr. William Nierenberg, Director of the Scripps Institution of Oceanography, representing the University of California's Marine Life Research Group, and E. Charles Fullerton, Director of the California Department of Fish and Game, signed an agreement to continue their cooperative scientific investigations in the California Current, an area of the Pacific encompassing 85,000 square nautical miles.

Since 1937 cooperative research has been conducted by the federal and state agencies on the pelagic marine resources of the California Current. Historically the research has operated under the umbrella of the State's Marine Research Committee (MRC) and since 1958 under the guidance of the CalCOFI Committee, a group composed of the directors of the principal agencies involved.

In 1978, the California Legislature did not renew the mandate of the Marine Research Committee and it was permitted to dissolve. Since both funding and administrative arrangements for CalCOFI had their legal basis in the MRC, it was necessary for the participating agencies to substitute a formal agreement for the old charter if the cooperative research were to continue.

Historically, CalCOFI-sponsored research has involved pooling staff facilities, and research vessels operated by the Center, Scripps Institution

of Oceanography, and the California Department of Fish and Game to conduct a series of cruises along a grid of stations, some of them extending more than 200 nautical miles out to sea.

Full-scale CalCOFI cruises are conducted presently every 3 years with monitoring and special cruises taking place in the intervening years.

In recent years, the U.S has been joined by the Instituto Nacional de Pesca of Mexico and the Pacific Research Institute of Marine Fisheries and Oceanography (TINRO) of the Soviet Union in their exploration of the California Current.

At the La Jolla Laboratory, CalCOFI-related research is carried out principally within the Coastal Fisheries Resources Division, headed by Dr. Reuben Lasker and a staff of 25 scientists and 15 supporting technicians.

Among the objectives of the program at the La Jolla Laboratory is to collect systematically and analyze biological information on the reproductive and population size of commercial and recreational fishes. At the same time, samples are taken during cruises to measure the chemical and physical properties of the California Current. This tremendous amount of data, acquired over the course of four decades, has been deposited in data banks in computer-compatible form and used by scientists at La Jolla to construct population and stock and recruitment models of fish populations to determine how they are affected by the ocean environment.

## CalCOFI Climate Symposium to be Held

As part of the annual CalCOFI Conference, Alec MacCall and John Radovich of the California Department of Fish and Game are organizing a symposium entitled, "Climatic and Ecological Regimes." Paper topics tentatively include atmospheric-oceanographic relationships, temporal structure of the ocean ecosystems, and studies of anaerobic sediments and tree rings.

## Aerial Fish Spotting Contracts to be Renewed

Computer Programmer J. Caruso began contract renewals for commercial fish spotting in FY 80. The pilots were contacted and all but one will participate in next year's program; Leon Durben, now 72, has decided to retire. Leon has been flying since 1928 and was one of the first fish spotters contracted in 1963. His participation in the program will be missed greatly.

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Dr. Lasker Returns from NSF Asian Trip

In early July, Dr. Lasker, returning from a National Science Foundation-sponsored trip to Korea, visited the Tokai Regional Fisheries Laboratory in Tokyo, the Tokyo University Department of Fisheries, and Ocean Research Institute to discuss clupeoid fisheries and the latest advances in Japanese aquaculture. Following his Asian excursion, he gave an invited talk at the Virginia Institute of Marine Science and attended an Ocean Sciences Board meeting, in Washington, D.C. Dr. Lasker has served on the National Academy of Sciences' Ocean Sciences Board for two years and this meeting was the last of his tenure.

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Dr. Howard Feder of the University of Alaska visited the Coastal Division for a week to discuss growth models with Mr. J. Zweifel, and a variety of research projects, including some on larval fish.

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Ms. Sandra Paez, recipient of this year's NOAA Junior Fellowship, is working with Dr. Lasker, learning to identify and enumerate the myriad forms of phytoplankton and microzooplankton associated with anchovy larvae in the Southern California Bight. This work is part of a larger project to characterize water masses as good or poor feeding grounds for anchovy larvae.

## Oceanic Fisheries Resources Division

### TUNA RESOURCES PROGRAM

### Final 1978 Atlantic Tuna Statistics Sent to ICCAT

The staff of the Tuna Resources Program submitted the final 1978 catch, catch-effort, and biological statistics for the American tuna fleet to the International Commission for the Conservation of Atlantic Tunas (ICCAT) on July 1, 1979. The data were prepared by Al Coan, Mathematician, Ronald Rinaldo, Fishery Biologist; and Robert Nydam, Computer Technician.

Yellowfin tuna was the dominant species in the American catch, accounting for approximately 53% of the total catch. Skipjack tuna contributed about 45% of the total.

1978 American purse seine catch of tropical tunas from the Atlantic Ocean
(Prepared by the National Marine Fisheries Service,
Southwest Fisheries Center, La Jolla,
California 92038. July 1, 1979)

| TOTAL CATCH (METRIC TONS) BY SPECIES | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Ocean Region | Yellowfin | Skipjack | Bigeye | Little Tuney | Auxis | Bluefin | Albacore | Other | Total | Number of Vessels 2/ |
| Eastern Atl. 1/ | 8,131 | 6,797 | 204 | 63 | | | 9 | 22 | 15,226 | 19 |
| Mid-Western Atl. | 1,606 | 1,632 | 44 | 18 | | | | | 3,300 | 7 |
| TOTAL | 9,737 | 8,429 | 248 | 81 | | | 9 | 22 | 18,526 | 20 2/ |

1/ Includes some catch by Netherlands Antilles tuna seiners

2/ Some vessels that fished in the Eastern Atlantic may have also fished in Mid-Western Atlantic so the total is not the sum of the vessels in the two areas.

Catch and effort statistics from logbooks were compiled by 1° and 5° areas of the Atlantic Ocean; approximately 75% of the total yellowfin tuna catch and 75% of the total skipjack catch were made in the Gulf of Guinea. July, August and September were the months of greatest catches for both yellowfin and skipjack tunas.

The catches were sampled to estimate the length frequency distribution of yellowfin tuna, skipjack tuna, and bigeye tuna caught. Age I fish (32-85 cm) accounted for 81% of the yellowfin catch. The bigeye tuna catch was composed of about 98% Age I fish clustered in the length range of 13-14 cm. Age I fish also dominated the skipjack tuna catch with 82% of the fish in the 37-51 cm size range.

## Division Head Attends Tuna Meetings in Spain

Dr. Gary Sakagawa, Leader of the Oceanic Division, attended the 1979 ICCAT officer's meeting and the skipjack subcommittee meeting from July 23 through 26 in Las Palmas, Spain. Sakagawa's attendance at the meeting served a twofold purpose: to help prepare an agenda and complete administrative details for the November meeting of the Standing Committee on Research and Statistics (SCRS), and to preside over the review of detailed activity plans for the International Skipjack Year Program. Sakagawa reports that the meetings were well attended and very successful.

The Officer's meeting was chaired by the SCRS chairman, Alain Fonteneau of France. It involved discussions on numerous topics: preparations for an ICCAT bluefin tuna workshop in September 1979; preparations for a CECAF-ICCAT juvenile tropical tuna meeting also to be in September; progress of the International Skipjack Year Program, progress in improving fishery statistics; new developments in data management; and plans for the November SCRS meeting. Other SCRS officers attending this meeting were Susumu Kume (Japan), convenor of the Subcommittee on Statistics, and Renaud Pianet (France), convenor of the Working Group on Data Management.

Sakagawa chaired the meeting of the subcommittee on skipjack tuna, attended by representatives from Brazil, France, Ivory Coast, Korea, Japan, Senegal, Spain, USA, USSR, and the United Nations' Food and Agriculture Organization. The participants reviewed and modified the detailed activity plans, reviewed the pledged contributions of participating countries, discussed the four-year program schedule, reviewed the 1980 proposed budget and made recommendations for the conduct of the second year of the program, 1980.

Dr. Philip Synous, ICCAT Program Coordinator, and Dr. Peter Miyake, ICCAT Assistant Executive Secretary, are preparing a report of the meeting, and will present it to the SCRS.

## Fourth North Pacific Albacore Workshop Held

Oceanic Division Leader Dr. Gary Sakagawa reports that he and other participants in the Fourth North Pacific Albacore Workshop estimated the maximum sustainable yield of albacore to be near 125,000 metric tons, but due to possible failures of several critical assumptions in the analyses, concluded that the precision and reliability of the estimate was poor. The participants did find that changes in the albacore catch age structure since 1971 have apparently caused a substantial decline in the yield-per-recruit, and have produced declines in the indices of spawning stock and possibly recruitment.

The workshop was held in Shimizu, Japan on June 25 and 26 as part of an agreement between the Far Seas Fisheries Laboratory of Japan and the Southwest Fisheries Center, to monitor the condition of the North Pacific Albacore stock. Attending from the Southwest Fisheries Center with Dr. Gary Sakagawa

were Drs. Norman Bartoo and R. Michael Laurs of La Jolla, and Jerry Wetherall of the Honolulu Laboratory. The meeting was chaired by S. Kume of Japan, and the 13-man Japanese delegation was led by Dr. S. Ueyanagi. Taiwan and Canada were represented by Dr. R. T. Yang and Dr. K. Ketchen, respectively. Bartoo and Dr. S. Kikawa (of Japan) served as rapporteurs for the workshop.

The workshop participants recommended several key areas for research as essential for future stock assessments:

- Some improvements in catch and effort statistics are needed,
- Stock and substock structure should be better defined,
- Questions on age and growth should be resolved,
- Robustness and sensitivity of stock assessment models should be evaluated, and
- Key oceanographic processes and parameters affecting CPUE, vulnerability, etc. should be quantified.

## New Environmental Data Collection System Becomes Fully Operational

Al Coan, Mathematician with the La Jolla Laboratory's Tuna Resources Program, reports that a new computerized data acquisition system for real-time environmental data is now fully operational. The new system is designed to collect marine weather observations from the National Weather Service's West Coast Marine Circuit for use in the NMFS Monthly publication Fishing Information and for on-going fishery-environment investigations.

The system was first conceived in 1977, and since then, system hardware has been purchased, communication lines have been secured, and system software has been written. In April of 1979, the new system became operational on an experimental basis, and in May and June it operated simultaneously with the system it was replacing while minor problems were being cured.

During the trial period, it became apparent that the new system could deliver 20 to 30 percent more data, with a considerable saving in labor. As a result, the old system, consisting of a teletype machine, a paper tape perforator, and two tape-to-card key punches, was removed. Its retirement signified the beginning of an era of improved data acquisition for the Tuna Resources Program with considerable savings in data processing costs.

The staff of the Tuna Resources Program plans to reduce the data processing costs and time further by having the new system plot environmental data fields that are currently prepared by the Burroughs 6700 at University of California, San Diego. A contract to develop the necessary software has been let.

## Environmental Observations from Tuna Vessels are Down

During June 1979, 15 tuna seiners contributed synoptic weather data to the NMFS FAX Advisory Program. A total of 54 weather and 9 XBT observations

were reported via NMFS-licensed radio station WWD. The table below lists program participation during June 1978 and 1979.

| | June 1978 | 1979 |
|---|---|---|
| Number of vessels with equipment | 52 | 46 |
| Number of vessels reporting | 18 | 15 |
| Number of weather obsevations reported | 136 | 54 |
| Number of XBT observations reported | 14 | 9 |
| TOTAL OBSERVATIONS | 150 | 63 |

Leading all program participants this month were the captains and crews of the Santa Rosa, Cheryl Marie and Cabrillo. Thanks are due these vessels and all contributors to the program.

## Biological Sampling of Foreign Imports of Atlantic Tunas Continues in Puerto Rico

Atlantic-caught tunas transshipped to Puerto Rico have been sampled routinely for biological information by La Jolla Laboratory scientists since March 1975. Data on fork length, weight and species composition are collected for monitoring of the fishery and for information on stock conditions.

Samples obtained during the period January through July 1979 are as follows:

| | | No. of Samples | No. of Fish Sampled | Tonnage Sampled (MT) |
|---|---|---|---|---|
| Yellowfin | Baitboat | 26 | 1405 | 410 |
| Skipjack | Baitboat | 9 | 457 | 1100 |
| | Purse seine | 3 | 151 | 1338 |
| Bigeye | Baitboat | 21 | 1067 | 207 |
| Albacore | Longline | 2 | 81 | 541 |
| TOTAL | | 61 | 3161 | 3596 |

Data are being analyzed by scientists at the La Jolla Laboratory.

## MARINE MAMMAL ASSESSMENT AND MONITORING

### Preparations Made for Porpoise Stock Assessment Workshop

The Marine Mammal Assessment and Monitoring Program staff is analyzing information on porpoise stock abundance and stock condition in preparation for a Stock Assessment Workshop, where their results will be reviewed by a panel of internationally-known experts. Workshop participants will focus on review of scientific information to assess the condition of porpoise stocks involved in tuna purse seining in the eastern tropical Pacific. They will also provide management advice on allowable kill and on research priorities. Final plans are being made for the meeting, which will be held August 27-31, 1979 at the La Jolla Laboratory.

### Investigation of Porpoise School Size Planned by IATTC

The Inter-American Tropical Tuna Commission has released an invitation for bids for the charter of a purse seiner with a helicopter. It plans to conduct school size investigation of porpoise in the eastern tropical Pacific during October and November 1979. LCDR Wayne Perryman attached to the Southwest Fisheries Center at La Jolla will provide photographic expertise, using a new 5" Format aerial reconnaissance camera to verify shipboard counts of porpoise school size.

### Porpoise Mortality Estimates Compared

The cumulative porpoise mortality through July 22 is 14,418 animals. The kill rates are: kill-per-set, 3.04, kill-per-ton yellowfin tuna caught on porpoise, 0.27; and kill-per-day fished, 1.15. The ratios during the same time period in 1978 were 3.37 kill-per-set, 0.30 kill-per-ton of yellowfin tuna, and 0.63 per day fished.

## MARINE MAMMAL BIOLOGY AND TECHNOLOGY

### Study of Porpoise Blood Chemistry Planned, Stuntz Visits Hawaiian Researchers

As part of a study to measure the physiological effects of porpoise chase and capture during purse seining, blood samples are to be drawn from captive Hawaiian spinner dolphins. Dr. Warren Stuntz, Leader of the Marine Mammal Behavior and Physiology Project, traveled to Hawaii last month to make arrangements with Sea Life Park, where the animals to be sampled are kept. Information gathered from the captive animals will serve as baseline data for comparison with blood of porpoise chased during tuna seining.

While in Hawaii, Stuntz visited Dr. Bernd Weursig and Randy Wells at Kealakua Bay, Hawaii, to discuss progress on the initial phases of their porpoise study, which is being conducted under a NMFS contract to University of California, Santa Cruz. Weursig and Wells are examining the school structure of a local population of Hawaiian spinner dolphins, and Stuntz will be involved in some phases of their work.

## Porpoise Studies Begun to Correlate Tooth Layers with Time

Dr. Al Myrick, Leader of the Marine Mammal Age Determination Project, has begun research to correlate layers in porpoise teeth with time, using tetracycline labels. One study being conducted jointly with Dr. Lanny Cornell (Sea World, Inc.) is examining tetracycline marks in layered tissues from approximately 20 animals, representing at least five species of odontocetes, that were given therapeutic doses of the antibiotic during their captive lifetimes. Dates and durations of these treatments will be used to interpret annual layer groups and rates of deposition as indices in determining real age from teeth of wild porpoise.

Another study, planned for 3 years and designed to monitor layer deposition directly in 16 live-captive Tursiops truncatus of both sexes and various age classes, was begun recently in cooperation with Hubbs' Sea World Research Institute. The project includes tetracyline injections and tooth extractions at regular intervals to generate layer/time information. The study will also investigate how changes in diet, age, and physical condition affect tooth-layering patterns.

## 10% Resight Results in Porpoise Tagging Project

Jacqueline Jennings, Leader of the Porpoise Tagging Project, reports that of the 656 porpoise tagged during Cruise IV of the Dedicated Vessel Program last fall, 68 tagged porpoise have been resighted. Most sightings have been made by observers aboard tuna seiners in the eastern tropical Pacific. These data have been entered into a computer data base and the distribution of the U.S. tuna fleet and intensity of its fishing effort are being plotted and examined to assist in interpretation of the resighting results.

## Net Deepening Experiment Continues

James Coe, Leader of the Marine Mammal Technology Project, reports that the first phase of a net-deepening experiment, conducted in cooperation with the tuna seiner, Cabrillo, has been completed to determine the effect of increased net depth on net volume and surface area. Gear technician Gene Anderson returned from a 60-day cruise aboard the Cabrillo where he made observations and recorded surface area and depth measurements on an unmodified net during normal fishing operations. The second phase, to begin in August, will record data on a working net deepened by two standard net strips. The

results will be used to assess the potential of wider nets for reducing porpoise mortality caused by net collapse and crowding.

Workshop Reports Being Completed

Dr. Warren Stuntz has distributed the report of the May 1979 workshop on "The physiological and pathological effects of chase and capture of porpoise" to the participants for comment. He expects the final report to be available in early August 1979.

The workshop report and selected papers presented at the 1978 marine mammal age determination conference are being compiled for publication by the International Whaling Commission (IWC), co-sponsor of the conference. Drs. Al Myrick and William Perrin, who have been editing the documents, report that the final draft of the workshop report and more than half of the papers have been completed and are undergoing final editing for inclusion in an IWC publication, Proceedings of the International Conference on Determining the Age of Odontocetes and Sirenians.

# PACIFIC ENVIRONMENTAL GROUP

## PEG Oceanographer Takes Part in Applied Commercial Fisheries Training Program

Pacific Environmental Group Oceanographer Lt. Dale Bretschneider attended a NOAA training program in applied commercial fisheries in July, held by the Department of Fisheries and Marine Technology at the University of Rhode Island. The intensive three-week course included both lecture and hands-on training. Participants learned how to mend and patch nets, and were taught to rig and construct a 29-foot high rise trawl.

Sea experience in the program included bottom trawling, midwater trawling, and clam dredging aboard the University's fisheries vessel, Gail Ann. Lectures dealt with an array of subjects: U.S. fishing operations, fishing techniques and equipment, purse seining; side trawling; vessel stability, twine work; and applications of electronice to fishing.

As part of the training, Bretschneider made a tour of the vessels and facilities at Pt. Judith, R.I., visited a net loft and a net factory; toured vessels at New Bedford, MA., and a rigging shop and fish auction, as well, and took a cruise aboard the NOAA ship Delaware II to participate in stern trawling operations.

The training was provided by NOAA's Office of Fleet Operations in preparation for Bretschneider's forthcoming assignment as third officer aboard NOAA's newest fisheries research vessel, the Chapman, which is now under construction. The 127-foot ship will be stationed at the Northwest Fisheries Center and will operate out of Seattle, Washington.

## McLain Visits ERL in Boulder

Oceanographer Dr. Douglas McLain visited the NOAA Environmental Research Laboratories (ERL) in Boulder, Colorado in July. PEG has had several contacts with ERL in the past to plan climate research, and will probably develop closer cooperative efforts in the future. PEG now provides updated marine weather data to ERL and has a contract from ERL to collect subsurface ocean temperature data in the tropical Pacific Ocean from ships of opportunity.

McLain talked with Dr. J. Fletcher at ERL, who is interested in global climatic fluctuations, and in particular, variation of sea surface temperature (SST) in the Pacific. Using historical SST data dating from about 1850, Fletcher has shown that anomalies of SST in the Antarctic Circumpolar Current between Australia and Antarctica can propagate northward into tropical waters. The relation of these anomalies to the El Niño and Southern Oscillation phenomena is as yet unknown but appears to be of fundamental importance in climatic changes.

While at Boulder, McLain learned of several new statistical computer programs being developed by ERL and the National Bureau of Standards laboratories. These programs offer several advantages over present BMD programs for processing time series data, particularly those series having significant persistence.

# TIBURON LABORATORY

## FISH COMMUNITIES INVESTIGATION

### Work on Three Manuscripts Progresses

Members of the Rockfish Analysis Task concentrated on writing and revising manuscripts this month.

Two manuscripts were completed and are being reviewed: 1) In "Shortbelly rockfish: do they migrate?", Dr. William H. Lenarz, Task Leader, and Fishery Biologist Tina Echeverria suggest that this rockfish moves into deeper water and travels northward as it grows. At the same time, they find evidence that females migrate southward each year during winter spawning and northward during the rest of the year. The manuscript discusses the implications of these movements in management of the species. 2) Dr. Lenarz and Ms. Echeverria, with co-author Dr. Ralph Larson (of the Marine Review Committee), prepared "Morphometric and meristic data on two sibling species of rockfish: Sebastes carnatus and Sebastes chrysomelas." This manuscript discusses the controversial taxonomic status of these closely related forms, based on relationships between their morphologies and their ecological niches. Also discussed is the possibility that relative numbers of the two forms in shallow water may reflect fishing pressures.

Revision of one manuscript was nearly completed: "Some statistical considerations of the design of trawl surveys for rockfish," by Dr. Lenarz and Fishery Biologist Peter Adams, includes in its revised form data from the 1977 coast-wide rockfish survey. These data are being used to answer criticism of reviewers who said that the original manuscript--which was based only on the 1976 Pilot Survey in Queen Charlotte Sound, British Columbia--contained insufficient data to support the authors' conclusions. The 1977 data provide additional evidence.

### Many Juvenile Rockfish Found on Mendocino Coast This Year

A large number of juvenile rockfish have settled in the nearshore habitats of the Mendocino coast this year, according to Dr. Edmund Hobson, Leader of the Fish Communities Task. Hobson says that the population is at least as large as during the plentiful 1977 season. The fish have been observed along ten miles of coast south of Fort Bragg by Hobson and Fishery Biologist Tony Chess.

Surveys show that the blue rockfish, Sebastes mystinus, predominates, but the black rockfish, S. melanops, the yellowtail, S. flavidus, and the canary, S. pinniger, are prominent. Others, including the bocaccio, S. paucispinis, are present in lesser numbers. Most rockfish group together by species and then aggregate in clusters that hover throughout the water column in kelp

forests and within two to three meters of the sea floor, above open rocky areas (see figure). The canary rockfish is an exception, being found by itself close to the sea floor above sand patches. Investigations from the shoreline to waters 20 meters deep show that the blue rockfish tend to be more numerous in the shallows, whereas the yellowtail is commoner at mid-depths, and the black is found in the deeper regions.

Tiburon Laboratory scientist amid a concentration of juvenile rockfishes, most of them blue rockfish, on the Mendocino coast in northern California.

FISHERIES DEVELOPMENT INVESTIGATION

## Commercial Trawl Made for Shortbelly Rockfish

Development of shortbelly rockfish fishery continues, according to S. Kato, Leader of the Fisheries Development Investigation at the Tiburon Laboratory. Shortbelly rockfish (Sebastes jordani) is the most abundant species of rockfish in California waters, but its small size has prevented conventional marketing. This month the commercial fishing vessel Pacific Trojan out of San Pedro made a trip to the San Francisco Bay area to catch shortbelly rockfish, using experimental fishing gear borrowed from the Tiburon Laboratory. The captain of the Pacific Trojan found that the fish moved quickly so that search time proved to be signficant, contrary to results of earlier cruises. The mid-water trawl lent by the Tiburon Laboratory to the fishermen is rather small (90-foot headrope), but catches of up to 6,000 pounds were made in one-hour tows.

Two major problems hindered operations. The telemetric net recorder failed to work coinsistently, and the by-catch, mostly chilipepper (a rockfish, Sebastes goodei), was greater than expected. Apparently chilipepper schools are similar to those of shortbelly, and the fishermen need to learn how to distinguish them on the fathometer. The chilipepper were large, but could not be landed because they were caught in a small-mesh trawl.

The catches of shortbelly were delivered to a pet food manufacturer and a fish wholesaler in southern California for processing and marketing tests.

One of the major contemplated uses for shortbelly rockfish is in the manufacture of "surimi," a minced fish product used by Japanese to make fish cake and sausage. Earlier trials by Japanese technicians indicated that surimi made from shortbelly rockfish was not of the highest quality. Scientists here, however, felt that the results may have been due to poor preservation of the fish, or because the flesh was in poor condition, having been obtained right after the spawning season.

Lieutenant Patrick Rutten and Kato, using methods learned from the Japanese technicians and machinery borrowed from the Northwest and Alaska Fisheries Center, made surimi from fresh shortbelly rockfish caught on the Pacific Trojan. Fish cake made from the surimi had better flavor and texture than in the previous trial, but the improtant characteristics of cohesiveness and elasticity were still lacking. Thus it seems likely that the minced product may be more suitable for domestic sale than for export to Japan.

To learn more about the requirements of the Japanese market, Kato will travel to Japan on a six-week trip starting in mid-August. Kato will work jointly with Dr. Sunee Sonu, an International Marketing Specialist from the Southwest Region, to learn which of our species have the best export potential, and how best to introduce them into the Japanese market. Kato expects to spend a considerable amount of time fishing aboard small vessels.

## Shark Age Determination Using Tetracycline Attempted

Fishery Biologist Susan Smith of the Tiburon Laboratory examined carcasses of 12 of the tank-held Triakis and Mustelus that had been injected last April and May with varying doses of the fluorophor oxytetracycline hydrochloride (OTC). These sharks, which had been held to determine the optimum dosage of OTC required to make a "time mark" on the vertebral centra, died unexpectedly in June. Although most exhibited fluorescence in the teeth, liver, and scattered placoid scales, none showed fluorescence on the centra. So far, only one tank-held shark, which was examined 32 days after injection, showed fluorescence on the centra. It had received the maximum dose of 50 mg per kilogram of body weight--twice that recommended for elasmobranchii by previous researchers.

It is possible that the sharks examined this month were not maintained long enough for the OTC to be incorporated in the centra, or that growth was inhibited by captivity. Although the optimum dosage could not be determined from the results, something was learned about the manner of tetracycline deposition. Where OTC localization occurred, it was selective and similar to that reported for teleosts, occurring in relatively "new" bone: the hindmost replacement teeth, a few scattered placoid scales on the ventral surfae and head, and distal edge of the centra. These findings differ from those of previous researchers who reported that in elasmobranchii, tetracycline is deposited in all calcified tissues present at the time of injection.

Tagging and injection of sharks in the field has been delayed while the research vessel Portola is being repaired. Because fishing time will now be reduced to two months, Ms. Smith will concentrate on only one species, the leopard shark (Triakis semifasciata). She hopes that examination of fish recaptured a year or more from now will enable her to determine, by using the OTC time reference label, whether the rings of the vertebral centra are annual, or in any way time related, and thus useful for age determination. In an effort to conserve boat fuel, the U.S. Coast Guard has given the Portola free berthing at Yerba Buena Island, close to the shark fishing grounds.

## Recreational Fisheries Improvement

Roger Green, Leader of the Recreational Fisheries Improvement Sub-Task, met with California Department of Fish and Game personnel at the Feather River Fish Hatchery in early July to discuss the logistics of delivering over 125,000 king salmon to the Tiburon Laboratory. The move is scheduled for the week of August 6, at which time the fish are expected to weigh an average of 15 grams each. Delivery is contingent upon attainment of this average size.

Nose tagging at the hatchery has been completed, six different codes were used, with groups ranging from 17,000 to 25,000 fish per group.

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Two carlin tags have been returned from the fall 1978 king salmon release of 1,700 fish. Both fish were between 7-8 inches at time of release, reported size at recapture was 21-23 inches. The salmon were taken in ocean waters along the California coast north of Tiburon.

The first recaptures of nose-tagged king salmon from 1978 were reported by California Department of Fish and Game port samples.

Physiology Investigations on Striped Bass Continue

Tiburon Laboratory staff continue their field and laboratory studies on the effects of environmental factors, including pollutants, on various life history stages of striped bass. Here is what is being done:

- Maxwell Eldridge, Dan Howard, Michael Bowers, and Mark Kobe are analyzing larval samples collected during laboratory studies of the effects of various food treatments.

- Staff scientists are analyzing bass eggs, embryos, and larva that were treated with radio-labelled benzene.

- The gonads, gametes, and other tissue samples from pre-spawning adult bass (collected by Brian Jarvis) will be analyzed. Scientists will measure, among other things, the uptake of low-boiling-point aromatic hydrocarbon pollutants in ovaries and liver. Pete Benville will run the gas chromatograph (GC) tests.

- Dr. Gerald Bowes of the State Water Resoures Control Board performed GC-mass spectrometric analyses of muscle from subadult bass collected in the Carquinez Straits. Tests were done with the cooperation of the Environmental Protection Agency Laboratory in Duluth, Minnesota, and the results are being assessed. Preliminary determinations reveal relatively high levels of low-boiling-point aromatics, such as the alkylated benzenes, corroborating Benville's earlier analyses, which detected these components in livers and ovaries of last year's pre-spawning samples. Bowes will continue making GC and mass spectrometric analyses on older fish as appropriate samples are available.

- Samples of striped bass will be sent to the Gloucester Laboratory for PCB analysis. They will be collected at varying times of the year from the San Francisco Bay-Delta.

- Dr. Jeannette A. Whipple and Brian Jarvis are analyzing blood cells and other blood parameters. They are photographing cell types found in the samples, and performing other work.

- Nina Hirsch, Richard Pimentel, and Mark Kobe (contract to San Francisco State University) are conducting laboratory experiments on the

effects of low chronic concentrations of benzene in subadult and pre-spawning striped bass. Workers constructed apparatus for the experiment, and fish have been acclimated for the study, to begin during the week of July 30.

- Dr. Whipple and Nancy Wiley (ADP Task) have completed a factor analysis of the 1978 pre-spawning and post-spawning adult striped bass samples, and results are being incorporated into a revised manuscript entitled: "The effect of inherent parental factors on gamete condition and viability in striped bass (Morone saxatilis)."

- Data collected from 1979 autopsies of striped bass are on coding sheets, and as aging and fecundity measurements are completed by the California Department of Fish and Game, the 1979 data will be keypunched and stored. Additional data from subsample analyses will be added as available.

- Summaries of all available data on pollutant concentrations in water, bass tissue and sediment samples from the San Francisco Bay-Delta area, including bioassay and experimental data, are being completed by Nancy Stapp in preparation for future reports and publications, and for the State Water Resources Control Board's August 6 hearing in San Francisco.

# SOUTHWEST REGIONAL DATA MANAGEMENT AND ADP OPERATIONS

## ORION Interface Problems Solved

In July, ADP staff continued to develop software programs for the ORION (Oceanographic Research Interactive Onboard Network) computer system, which will collect and analyze CalCOFI, XBT, shipboard housekeeping, navigation, and tracking data onboard the R/V David Starr Jordan. The computer hardware consists of a H.P. 9845 computer, two H.P. 2640 CRT units, and an analog-digital computer. problems with linking the computer's components together caused slight delays, prompting the ORION Steering Committee to meet so application priorities could be redefined. Mike Webb of the Pacific Marine Center was at the Center on July 11 and 12, and partially resolved the instrumentation linkage problems. Jack Brown and Mark Sullivan worked out the remainder of the CAMAC difficulties. Finding the H.P. and CAMAC systems to be compatible, ADP is now developing a simulator for the total system.

## Data Management Activities Continue at the Southwest Center

Creation of the Coastwide Summary Data Base and the merged Coastwide Data File for the years 1974, 1975 and 1976 is now well under way. The data file will contain vessel and landing information from the states of California, Oregon, and Washington. The SWFC finally received the last of the data tapes from the State of Washington. ADP staff completed the programs that create the summary data base, and wrote appropriate documentation.

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Contractors for ADP started to design and implement the Billfish Data Base System, to contain recovery and release data on billfish. Several meetings were held with the users to determine requirements. The data base design was completed during July, and ADP staff started to write computer programs for editing and updating the file.

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ADP continued to develop a system of plotting programs utilizing the INFONET DISSPLA Plotting Package. This system is intended for use with International Whaling Commission data and by the Marine Mammal Data Management Group. During July, two main programs and four subroutine subprograms were coded in FORTRAN IV and debugged. One more main program is in the process of being coded, and this will complete the system, which should be fully implemented by the middle of August.

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Dorothy Roll, Computer Systems Analyst, reports that UCSD is in the process of implementing the VAX-11/780 (Virtual Address eXtension) system, which will replace the CDC 3600. VAX is a powerful system, designed to speed data handling, and has extensive record and file management capabilities. It supports two text editors; one is interactive and the other is programmed. VAX uses FORTRAN IV-PLUS and other high-level languages. During the first few weeks in August, UCSD is allowing free access to VAX for valid users.

Butch Burris, Computer Programmer, completed two programs that validate unsexed larval data. Using the VAX-11/780 during the free access period, Burris will begin making production runs editing the 1972 unsized larva data.

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Systems Analyst Dorothy Roll is writing an overview of the CalCOFI Data Management System. Her report will be a general presentation of the system definition, design and implementation, data base structures and descriptions, and data traffic flow and processing procedures.

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ADP staff continued to work on the Southwest ADP Requirements Study, which is to assess the Center's future computer needs. Personnel from the Honolulu Laboratory were interviewed during July, and several meetings were held with staff from UCSD to discuss use of the University's computer system. ADP personnel also evaluated several federal computer systems to see if they met the Center's ADP requirements. The ADP Requirements Study should be completed by September 1979 for review by the Southwest Center and the Regional office.

PRESS RELEASES

Honolulu Laboratory

July 13 - "Tagged blue marlin recaptured in Hawaiian waters."

17 - "Tunas induced to spawn in captivity for the first time."

HONORS AND AWARDS

At a general staff meeting at the Honolulu Laboratory on July 24, SWFC Deputy Directory John Carr presented length-of-service pins to the following Honolulu Laboratory employees:

Tamotsu Nakamura (30 years)
Heeny S. H. Yuen (30 years)
Donald C. Aasted (20 years)
Shoji Teramoto (20 years)
Paul M. Shiota (15 years)

Also honored for length-of-service this month are Charles Wright, Engineering Technician (15 years) and Gail Theilacker, Fishery Biologist (20 years), of the La Jolla Laboratory.

Stauffer Honored in Home Town

Fishery Biologist Dr. Gary Stauffer of the La Jolla Laboratory returned to his home town of Wenatchee, Washington, to receive a Distinguished Alumnus Award from Wenatchee High School, seventeen years after his graduation. Stauffer was honored for his work in fishery biology, done at the Southwest Fisheries Center.

SEMINARS

Honolulu Laboratory

July 20 - Dr. Calvin M. Kaya, Montana State University, spoke on "Induced spawning of kawakawa."

26 - Dr. Rene Grandperrin, Fisheries Advisor, South Pacific Commission, Noumea, New Caledonia, spoke on, "Activities of South Pacific Commission Fisheries."

La Jolla Laboratory

July 10 - Dr. George Seber, Professor of Statistics at Aukland University in New Zealand, gave a seminar entitled, "Recent developments in line transect methods."

12 - Percy M. Washington, Jr., from the Northwest and Alaska Fisheries Center, gave talk on "Marine recreational fishery research in Puget Sound, 1972-1979."

24 - Dr. Van Holliday of Tracor, Inc., presented slides and discoursed on the subject of "High frequency resonance studies of biological acoustic targets."

31 - Dr. Warren Stuntz, scientist at the Southwest Fisheries Center, gave a seminar on hypothesized "Aspects of capture stress in dolphins."

Tiburon Laboratory

July 16 - Percy Washington, Northwest and Alaska Fisheries Center, presented a seminar at the Tiburon Laboratory on his studies of the recreational fishery in Puget Sound.

TRAINING

July 18 - The following employees are taking part in the course being given by Dr. William H. Lenarz: "Applied Regression Analysis and Multi-Variable Methods - Application to Current and Future Research."

Pete Benville
Michael Bowers
Candis Cooperrider
Tina Echeverria
Daniel Ralph
Patrick Rutten
Susan Smith
Ed Ueber
Nancy Wiley

23-27 - Ed Ueber - Supervision and Group Performance, OPM.

MEETINGS AND TRAVEL

Honolulu Laboratory

July 16 - Drs. Adams and Mendelssohn met with personnel from the U.S. Army Corps of Engineers who are interested in collecting baseline data for Guam to be used in a benefit-cost analysis.

17 - Shomura attended a meeting called by Dr. Stanley Swerdloff, Project Manager of the State-sponsored Hawaii Fisheries Development Plan, to discuss the status of the Master Plan.

17-23 - H. Yuen traveled to Agana, Guam, for the Third Annual Marianas Fishing Derby.

20 - Shomura attended a meeting to discuss fishery development with H. Ness, Southwest Region, D. Gates, WPPO, M. Stahl, and Dr. S. Swerdloff of the Hawaii Fisheries Development Plan office.

La Jolla Laboratory

Dr. William Perrin, Leader of the Marine Mammal Biology and Technology Program, returned from the International Whaling Commission meetings in Cambridge, England early in July where he chaired the sessions of the Sub-Committee on Small Cetaceans. Major items treated by the Sub-Committee included a review of the status of the white whale and narwhal, effects of pollution and industrial development on small cetaeans, whaling for killer whales in the north Atlantic and Antarctica, and competition between small cetaceans and fisheries.

Other Travel Includes:

July 2 - Huppert met with Ness, Silverthorne and Fraser on Center/Region economics programs at Terminal Island.

8-12 - R. Lasker traveled to Norfolk, VA to give a seminar at the Institute of Marine Science, and to Washington, D.C. to attend the Ocean Sciences Board meeting.

9-11 - M. Laurs traveled to Monterey to meet with Ocean Data Systems concerning SEASAT data products and Navy Post-graduate School personnel regarding the EPOC program.

9-13 - F. Kellenberger traveled to Honolulu to meet with Honolulu Laboratory personnel on data management activities.

10-13 - D. Huppert traveled to Los Angeles to attend meetings of PFMC economists, Scientific and Statistical Committee and the PFMC.

10-17 - W. Stuntz traveled to Honolulu and Hilo to oversee progress on the porpoise behavior project and to determine log requirements for radio tracking studies.

11 - J. Carr traveled to Los Angeles to meet with Region personnel concerning Pacific Island Development Project.

11-13 - G. Stauffer and A. MacCall traveled to Los Angeles to attend the PFMC meeting.

12-13 - J. Squire traveled to Los Angeles to attend the PFMC meeting.

13 - I. Barrett, J. Carr, D. Mackett and R. Allen traveled to Terminal Island for a meeting on the FY 82 budget presentation.

13-18 - I. Barrett traveled to San Jose, Costa Rica to continue discussion on a new IATTC treaty.

17 - MacCall, Stauffer and Huppert met with CF&G personnel in Long Beach on jack mackerel/pacific mackerel interaction problem.

18 - MacCall attended CalCOFI Committee meeting in La Jolla.

19-20 - McMillan in Seattle to confer with Marasco and Mort Miller on fishing vessel construction study.

22-29 - G. Sakagawa traveled to Las Palmas, Canary Islands to attend the annual planning meeting for officers of the Standing Committee on Research and Statistics (SCRS) of the International Commission for the Conservation of Atlantic Tuna (ICCAT) and a meeting of the SCRS Skipjack Tuna Sub-Committee.

23-25 - A. Coan traveled to Pascagoula, MS to attend a meeting at the Pascagoula Laboratory on longline observer data.

23-26 - J. Carr traveled to Honolulu to consult with members of the WPFMC concerning research.

24-26 - B. Remington traveled to Tiburon to particpate in discussions with SFSU and Tiburon officials on site improvement at Tiburon, and to Seattle to discuss financial and administrative matters with NASO officials in Seattle.

30 - Fred Kellenberger traveled to the Tiburon Laboratory to participate in the review of data management activities there, and stopped at the GSA office in San Francisco to discuss ADP contracts.

Pacific Environmental Group

July 1-16 - Donna Mallicoate traveled to Long Beach, CA to obtain fish data on file with the California Dept. of Fish and Game.

9-27 - Paul Sund traveled to Friday Harbor, WA to draft a manuscript with co-author Maurice Blackburn.

- Dale Bretschneider traveled to Wickford, RI to attend the Marine Fisheries Technology Course at the University of Rhode Island.

15-17 - Dr. Douglas McLain traveled to Boulder, CO to present a seminar at ERL on PEG's ocean climatology work.

24-25 - Dr. Richard Parrish traveled to La Jolla, CA to discuss contract proposal with personnel at SWFC.

Tiburon Laboratory

July 5-7 - Sus Kato traveled to Seattle, Washington, to discuss net design with a commercial trawl manufacturer, and to learn about the operation and maintenance of a deboning machine at the Northwest and Alaska Fisheries Center.

10 - Sus Kato traveled to Davis, California, to observe the demonstration of a squid cleaning machine developed by Dr. Paul Singh and associates under a Sea Grant project.

10-11 - Ed Ueber met in Los Angeles, California with economists from the Northwest and Southwest Regions, and the Southwest Fisheries Center, to discuss data requirements for socio-economic studies.

11 - Dr. William H. Lenarz attended the Groundfish Team/ Advisory Panel Meeting and Brown Pelican Committee Meetings in Los Angeles, CA.

11-13 - Ed Ueber chaired the meeting of the Groundfish Plan Development Team, together with its Advisory Panel, in Los Angeles, California.

12 - Dr. Jeannette A. Whipple gave a presentation on striped bass research to Environmental Protection Agency at a meeting in San Francisco, California for approximately 50 attendees.

17 - Sus Kato and Ed Ueber met with personnel of the California Department of Fish and Game at Menlo Park, California. Major topics of discussion were mesh size restrictions on trawls used by commercial fishermen in our development projects, and by-catch allowance when using such trawls.

- Daniel Ralph and Susan Smith traveled to Oroville, CA., to service the imprinting apparatus at the Feather River Hatchery, and obtain size estimates on king salmon fingerlings scheduled for delivery to the Tiburon Laboratory.

18-20 - Norman J. Abramson attended the Shrimp Management Plan Development Team Meeting in Portland, Oregon.

23 - Norman J. Abramson and Dr. Jeannette A. Whipple met with James W. Rote, NMFS Office of Habitat Protection, at the Tiburon Laboratory to discuss recent pollution research conducted at Tiburon.

25 - Norman J. Abramson, Dr. Jeannette A. Whipple, and Pete Benville met at the Tiburon Laboratory with Dr. Gerald W. Bowes and Marvin Jung, State Water Resources Control Board. The meeting was held to review results of chemical analyses on striped bass which were conducted by Dr. Bowes.

26 - A Sewage Treatment Meeting was held at the Tiburon Laboratory to decide whether proceedings should continue with Phase II of the Survey (Option I of the Survey) and whether San Francisco State University would be a part of the design phase. Attendees included: John Hinman, Chief, Administrative Operations Division, NASO; Eddie Tate, Project Engineer, NASO; Ben Remington, Executive Officer, Southwest Fisheries Center, La Jolla; Jim Daugherty and Leroy Carlenzoli, Brelje and Race, Inc., Santa Rosa, and the following San Francisco State University representatives: Dr. Konnilyn Feig, Vice President for Administration, Dale Fleming, Chief Administrative Services; Morgan Griffiths, Plant Engineer; and Dave Taylor, Plant Manager. Norman J. Abramson and Walburga Giguere, Tiburon Laboratory, also attended the meeting.

VISITORS

Honolulu Laboratory

July 1 - Niyom Lohakarn and Peerasak Jantaragpagdee, fishery trainees from Thailand departed Honolulu to return home after completing a 3-month training program at the Honolulu Laboratory.

3 - Dr. Albert H. Banner of Hawaii Institute of Marine Biology met with Mr. Shomura to discuss ciguatera problems.

10 - Margo Stahl of the Division of Fish and Game's Hawaii Fisheries Development Plan office met with Mr. Shomura to discuss fishery data.

11 - Sue Heftel of the Research Law School, University of Hawaii, met with Mr. Shomura to seek information regarding fisheries in the South Pacific.

12 - Shomura was visited by Dr. Warren Stuntz of La Jolla. Mr. Alvin Katekaru of the Hawaii State Division of Fish and Game visited Shomura to discuss the State's aggregation device program.

16 - Dr. Robert Doktor met with Shomura to discuss a study Doktor is undertaking on how fisheries information from the Honolulu Laboratory is transferred to outside user groups, e.g., Western Pacific Regional Fishery Management Council.

19 - Dr. Michael Orbach, Social Antrhopologist and Social Science Advisor, NMFS, Washington, D.C. met with Shomura and with Adams to discuss the SK fisheries development project for the western Pacific. Orbach was en route home from Singapore.

21 - Dr. Rene Grandperrin, Fisheries Advisor, South Pacific Commission, Noumea, New Caledonia, arrived in Honolulu to (1) visit various organizations, farms, and institutes dealing with fisheries, aquaculture, and other fishery development related fields and (2) attend the Marine Turtle Workshop at the Honolulu Laboratory, July 31-August 2.

23 - SWFC Deputy Director John Carr arrived in Honolulu to (1) meet with Shomura, (2) meet with Western Pacific Regional Fishery Management Council officials, and (3) attend a portion of the Pacific Islands Fishery Development Commission meeting on July 25 with Shomura.

La Jolla Laboratory

July 9 - Stanley M. Warlen, Beaufort Laboratory, Southeast Fisheries Center, Beaufort, North Carolina.

10 - Jim Bray, University of Washington.

11 - George Seber, Aukland University, Aukland, New Zealand.

- Earl E. Ebert, Cal. Dept. of Fish and Game, Monterey, CA.

- Michael D. Webb, Pacific Marine Center, Seattle, WA.

14 - H. Lauo, Japan Kydo Co., Ltd., Higashimada, Kobe, Japan.

- L. Saito, K&S International Corp., San Diego.

17 - Jim Cunningham, Upward Bound, Harvey Mudd College.

20 - Malcolm Francis, Zoology Dept., University of Canterbury, Christchurch, New Zealand.

30 - Joel Young, Ametek Straza, El Cajon, CA.

- Fran Rowe, Ametek Straza, El Cajon, CA.

- J.B. Cowen, Ametek Straza, El Cajon, CA.

- Wayne Alley, California State University, Los Angeles, CA.

Pacific Environmental Group

July 10 - R. Michael Laurs, NMFS, La Jolla, CA.

- James C. Kelley, San Francisco State University, San Francisco, CA.

13 - Roy Ally, Dept. of Fish and Game, Long Beach, CA.

24 - Dr. Peter Tatro, Science Applications, Inc., McLean, VA.

- Jerry D. Jarrell, Science Applications, Inc., Monterey, CA.

Tiburon Laboratory

July 2 - Christopher W. Bomar, San Francisco State University, San Francisco, CA.

- J.W. Sloane, San Francisco State University, San Francisco, CA.

3 - Morgan J. Griffiths, San Francisco State University, San Francisco, CA.

6 - Philip W. Ware, Berkeley, CA.

9 - Jaranthada Karnasuta, Department of Zoology, University of Alberta, Edmonton, Alberta, Canada.

12 - William T. Davoren, U.S. Fish and Wildlife Service, Sacramento, CA.

- Phil Meyer, U.S. Fish and Wildlife Service, Sacramento, CA

13 - Thomas Currier, San Rafael, CA.

- Morgan J. Griffiths, San Francisco State University, San Francisco, CA.

- Howard Harris, San Francisco State University, San Francisco, CA.

- Marvin Jung, State Water Resources Control Board, Sacramento, CA.

18 - Mike McGowan, San Francisco State University, San Francisco, CA.

20 - Donald Brambilla, Department of Biology, University of South Carolina, Columia, S.C.

23 - James W. Rote, National Marine Fisheries Service, Washington, D.C.

25 - Gerald W. Bowes, State Water Resources Control Board, Sacramento, CA.

- Marvin Jung, State Water Resources Control Board, Sacramento, CA.

26 - Leroy Carlenzoli, Brelje & Race, Inc., Santa Rosa, CA.

- Jim Daugherty, Brelje & Race, Inc., Santa Rosa, CA.

- Konnilyn Feig, San Francisco State University, San Francisco, CA.

- Dale A. Fleming, San Francisco State University, San Francisco, CA.

- Morgan J. Griffiths, San Francisco State University, San Francisco, CA.

- John Hinman, NASO, Seattle, WA.

- Ben Remington, Southwest Fisheries Center, La Jolla, CA.

- Eddie Tate, NASO, Seattle, WA.

- Dave Taylor, San Francisco State University, San Francisco, CA.

30 - Fred Kellenberger, SWFC, La Jolla, CA.

31 - William O. Dooms, Erin Sales International Corporation, Oakland, CA.

PERSONNEL

July 1 - Christine E. Siu, Biological Aid (Microbiology) - 700-h appointment (Honolulu Laboratory).

2 - Daniel R. Fehr, Biological Aid - Expiration of temporary appointment (Tiburon Laboratory).

3 - Kathleen Fourre, Biological Aid - Expiration of temporary appointment (Tiburon Laboratory).

- Janet E. Mason, Biological Aid - Expiration of temporary appointment (Tiburon Laboratory).

5 - Richard Harris, Technical Writer/Editor - 700-h appointment (La Jolla Laboratory).

6 - Gail Okuda, Data Transcriber - Resignation (Honolulu Laboratory).

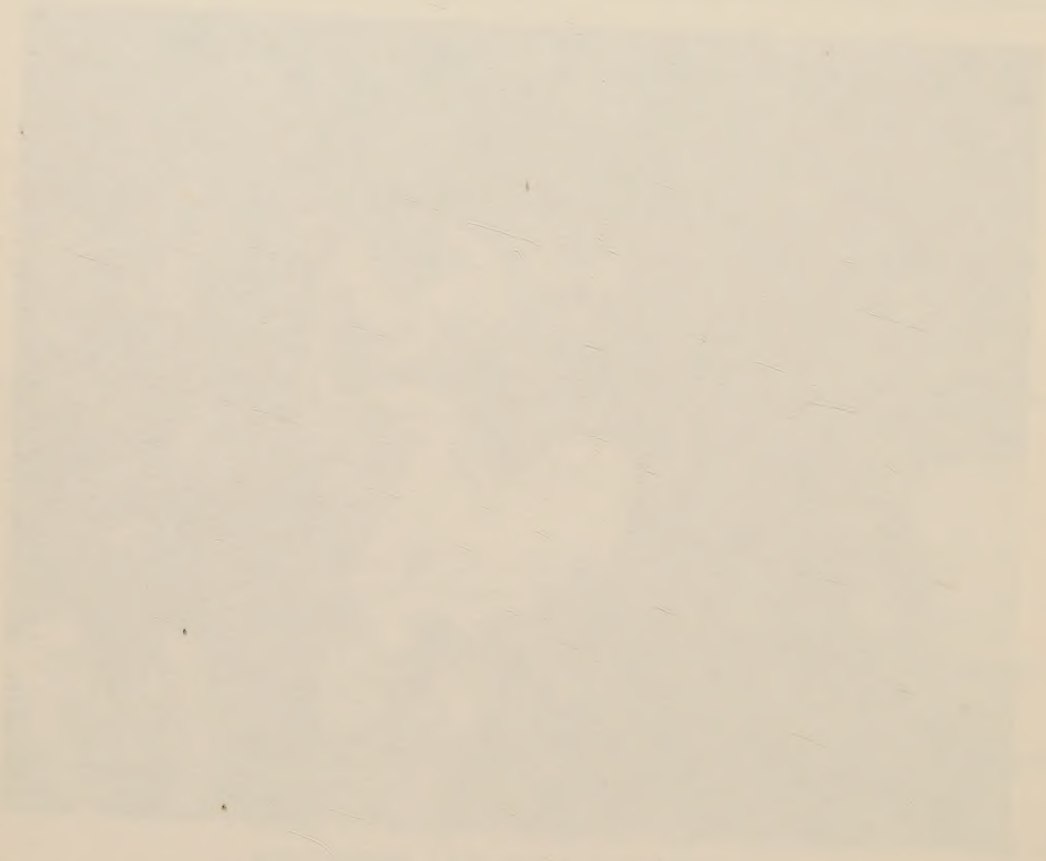
20 - Donna Mallicoate, Statistician - Promotion (PEG).

29 - Priscilla Sloan, Biological Technician - Promotion (La Jolla Laboratory).

- Frank Ralston, Computer Specialist - Promotion (La Jolla Laboratory).

1979-80 EEO Committee Appointed

Pictured is the La Jolla Laboratory's 1979-80 Equal Employment Opportunity (EEO) Committee. Back row: (left to right): Frank Ralston, DeLoris Hobbs, Marleen DiBona (also Federal Women's Program Manager), Ron Dotsun (Chairman), and EEO Concellor-in-training Elaine Sandknop. Front row: Al Myrick, Henry Orr (also Hispanic Program Manager) and Pete Paloma. Not pictured: Jane McMillan. Committee members welcome open dialogue with Center employees on all matters of employment opportunity.



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